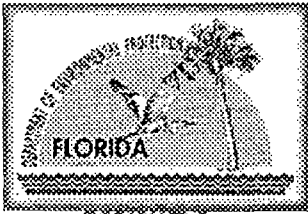


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Phosphate Industry



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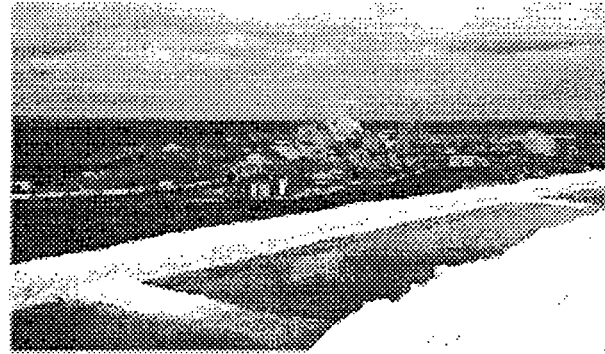
Along with tourism and agriculture, the phosphate industry is one of Florida's oldest and largest industries. With its vast phosphate deposits, the majority of which are located in the west-central part of the state, Florida has become one of the world's largest

producers of phosphate and accounts for 75% of the nation's and 25% of the world's phosphate production. Greater than 90% of the phosphate is used for its phosphorus to produce inorganic fertilizer. Wastewater associated with the phosphate industry, especially that generated by the manufacture of fertilizer, contains various pollutants that can exceed water quality standards and, if left untreated, could cause adverse impacts to the environment.

Phosphate production begins with the mining of calcium phosphate (phosphate rock). Typically, phosphate rock is found at an average depth of 25 feet beneath the ground's surface. The surface sediment overlying the phosphate, known as overburden, consists mostly of sandy soil. The overburden is removed and stockpiled for future use in reclamation of the site. Once the overburden is removed, a matrix of phosphate pebbles, sand and clay is exposed. The matrix is mined and deposited in a shallow containment area known as a well. While in the well, the matrix is sprayed by high-pressure water guns that liquefy the material into a mixture called a slurry. The material is then transported through pipelines to a beneficiation plant, where the clay and sand are separated from the phosphate rock. The first step in separating phosphate from the clay and sand is to put the slurry in a washer where large balls of clay are mechanically disintegrated. The slurry then moves through a series of vibrating screens where fine clay particles pass through and the phosphate pebbles remain. The clay is then pumped to settling ponds while the pebbles are moved to dewatering tanks and stockpiled by conveyors for further processing. Also separated in the process is a mixture of sand and finer particles of phosphate (concentrate) that is then put through a process called flotation. In the flotation process, the mixture is put in a vessel of water where

reagents such as fuel oil, soap or fatty acids are mixed in to coat the concentrate and attach air bubbles, allowing it to float, separating it from the sand. The sand is transported back to the mine and stockpiled for reclamation while the concentrate is transported to dewatering tanks and stockpiled for further processing.

Once the phosphate has been separated from the matrix and dewatered, it is ready to be processed into components used in inorganic fertilizers. In order to make the phosphorus in phosphate rock more readily available to plants, the phosphorus must be in a soluble



form. The process begins with the phosphate rock being ground into a fine uniform grain size. It is then reacted with sulfuric acid to release the phosphorus from its chemical bond with calcium and other elements. The reaction of the phosphate rock with the sulfuric acid produces phosphoric acid and hydrated calcium sulfate (phosphogypsum), a by-product. The phosphoric acid is then separated from the phosphogypsum and concentrated. The concentrated phosphoric acid is finally used to manufacture ingredients for inorganic fertilizer. Examples of ingredients are diammonium phosphate and monoammonium phosphate which are produced when phosphoric acid is reacted with anhydrous ammonia (for its plant-available nitrogen). Another fertilizer ingredient, produced by mixing phosphoric acid with finely ground phosphate rock, is granular triple superphosphate. Meanwhile, water is added to the phosphogypsum by-product to create a slurry that is hydraulically pumped to a lagoon.

As phosphogypsum lagoons fill, the solids are scooped out to build up the sides, forming another lagoon on the resulting phosphogypsum stack that increases in height (up to 200 feet high) as the process continues. The process water that remains after the solids settle out is returned to be reused in processing the phosphoric acid. The acidic nature of the process water is of major concern to DEP. Without proper treatment aquatic life can be seriously affected when this highly acidic water enters state waterbodies from careless spills or failed structures. On December 7, 1997, a spill at the Mulberry Phosphates, Inc., facility in Polk County entered the Alafia River via Skinned Sapling Creek and caused major damage to the ecosystem, killing off much its biota (for details see the [DEP press release](#)).



The phosphogypsum by-product presents a serious disposal problem for the phosphate industry.

Normally, gypsum is a material with uses for such things as plaster, dry wall, soil conditioner, cement retarder and road base, but because of impurities such as